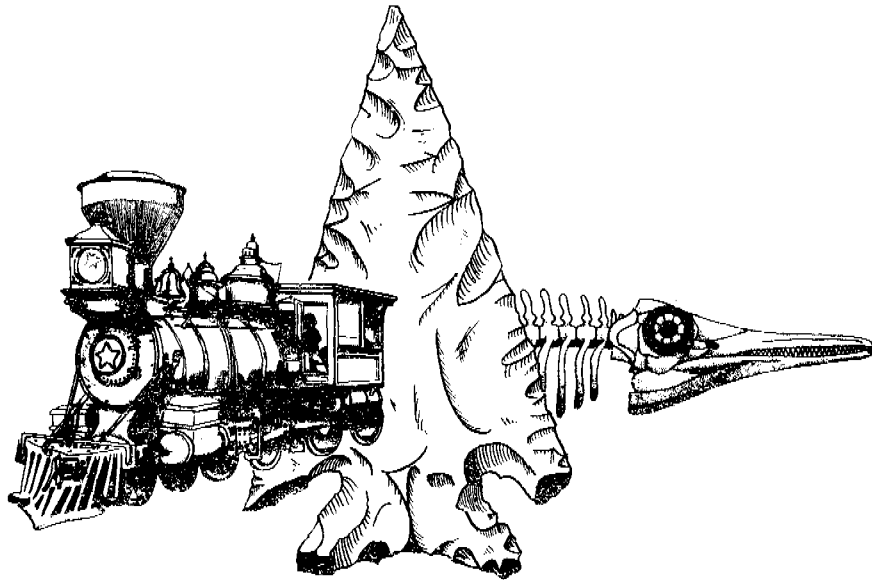


BUREAU OF LAND MANAGEMENT  
NEVADA

CONTRIBUTIONS TO THE STUDY OF CULTURAL RESOURCES



THE LAKE RANGE QUARRY  
WASHOE COUNTY, NEVADA

Kathryn E. Pedrick

TECHNICAL REPORT NO. 14

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## FOREWORD

Archaeological information provided in this volume results from field investigations conducted jointly by the Bureau of Land Management and the Nevada State Museum staffs at a prehistoric chert quarry site endangered by proposed mining activity. Knowledge of the quarry contributes to our understanding of the archaeological record of northwestern Nevada. This raw material source lies in an apparent strategic location, central to three large hydrologic basins (Black Rock Desert, Pyramid Lake and Winnemucca Lake) which likely held water throughout much of the period of prehistoric occupation of the region.

We are pleased to be able to disseminate this information. Given the regulations that govern mining operations on public lands administered by the Bureau of Land Management, little in the way of funding is available to the agency for salvaging important cultural values which are threatened by planned mining activity. In this case, the Bureau and the Nevada State Museum, with some funding assistance offered by the Amax, Inc., conducted the field work and analysis on a very limited budget. This volume constitutes a rewarding completion of this effort to all involved.

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March, 1985

THE LAKE RANGE QUARRY  
WASHOE COUNTY, NEVADA

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# ABSTRACT

The Lake Range Quarry site (26 WA 3012), threatened by proposed mining activities, was surface collected and test excavated by archaeologists from the Bureau of Land Management and the Nevada State Museum. Quarrying activities and lithic reduction processes of raw chert material were investigated using a set of hypotheses tested with artifacts from the site. The artifacts consisted of large first stage reduction bifaces, hammerstones, and a high percentage of flake debitage and shatter. Results of the study show that the primary activity occurring on the site was the testing and acquisition of raw chert material. First stage bifaces appear to have been the preferred product for transport away from the site.

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## INTRODUCTION

In July 1981, a routine field inspection for a proposed mining exploration project revealed a large, prehistorically utilized, chert quarry, subsequently named the Lake Range Quarry, 26 WA 3012 (Smith 1981). Although a portion of the quarry was first located in 1978 by Norman Smyers (1978), a BLM geologist, the extent of the site was not discovered at that time (Roney 1978). The site covers approximately 250 acres with a core segment of 20 to 25 acres. The core area represents a high intensity activity zone used for the acquisition and reduction of raw chert material. The density of surface materials was exemplified by a one by one meter square surface flake count taken at the site which yielded 1,070+ flakes. Other features on the site include 17 discernible quarried pits, three to five meters in diameter and up to 1.5 meters deep. The pits were located where bedrock material was accessible from shallow subsurface rock formations. In addition to the quarried pits, bedrock outcrops, boulders, and smaller rock fragments were reduced for lithic material. Bifaces and biface fragments, hammerstones, cores, and large flakes cover the surface. A "cache" of bifaces was located adjacent to a quarry pit in the northern portion of the site. The chert material from the site varies in color but is predominantly light beige, pink, and white.

In order to adequately salvage important information from the quarry prior to its possible destruction, a data recovery strategy was formulated by the Nevada State Museum Archaeological Services. The strategy consisted of general research questions addressing quarry activities and lithic reduction processes which have been the focus of studies elsewhere in the Great Basin. A model for investigating large prehistoric lithic quarries has been developed using elements from previous studies (Womack 1977; Knudson 1975). The field element of the data recovery plan was designed to include intensive recording and mapping, surface collection of a sample of artifacts, and at least one test excavation pit to determine if buried cultural deposits were present.

Amax Explorations, Inc., provided funding to assist in the field work, the Nevada State Museum designed field methodology, provided technical assistance, laboratory analysis and curation space, and the BLM provided the majority of the field crew with personnel from the Winnemucca District Office and the Nevada State Office.

## SETTING AND ENVIRONMENT

The Lake Range Quarry site is a large prehistoric chert quarry located on a narrow, low ridge at the north end of the Lake Range in Washoe County, Nevada, approximately 12 miles south of Gerlach, Nevada (Figure 1). The Lake Range is part of the Basin and Range Physiographic province in what was once part of the Lake Lahontan Basin. The range itself is



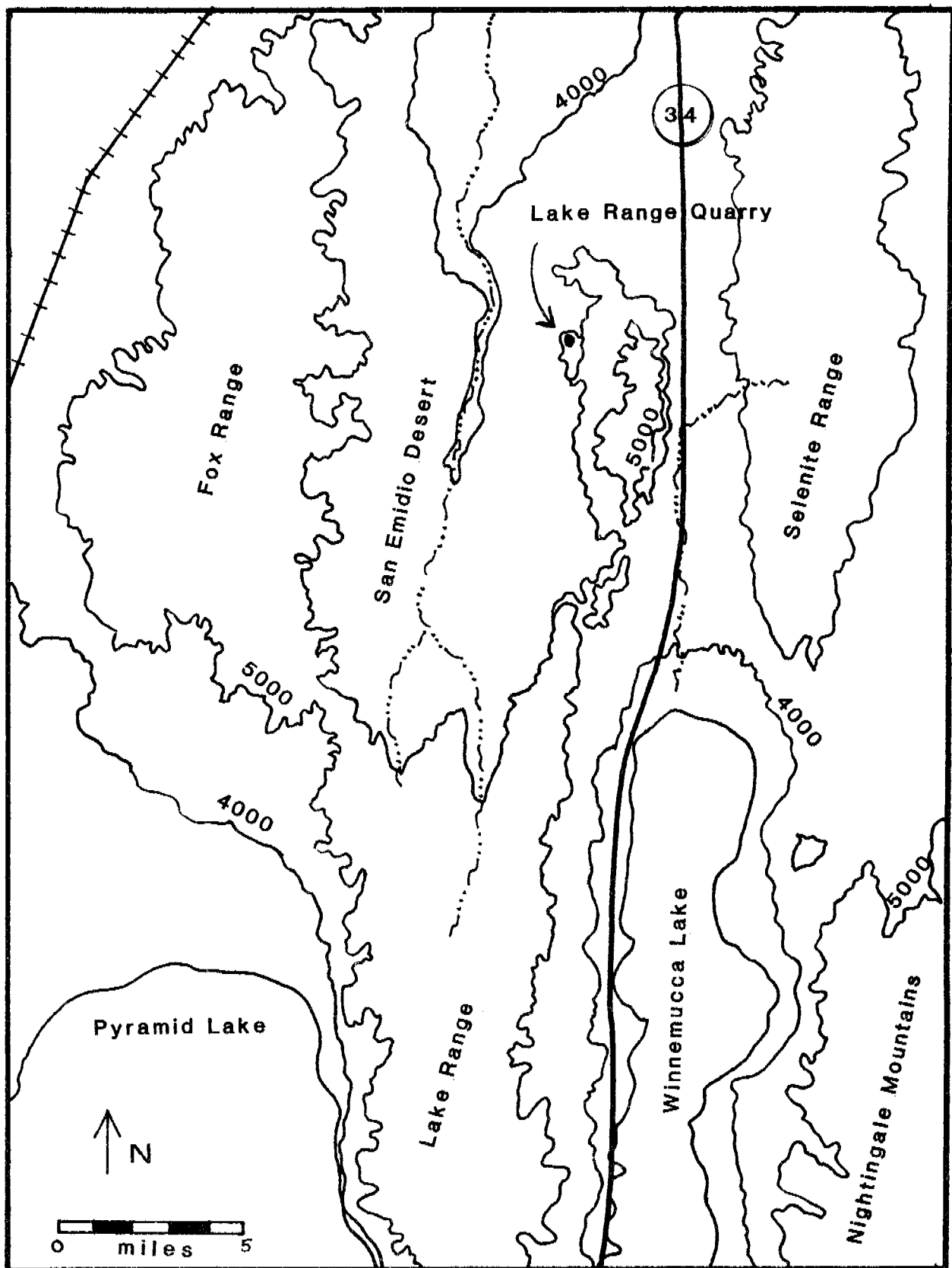


Figure 1. Lake Range Quarry Location

"an eastward tilted block, bounded on the west by northerly-trending faults . . . with substantial dip slip. A small area of Mesozoic metamorphic rocks, chiefly slate and quartzite, is exposed at the north end. The rest are Miocene and Pliocene volcanic rocks with lenses of tuffs, pyroclastics and sedimentary rocks" (Bonham 1969:49).

The quarry itself is a tuffaceous formation with cryptocrystalline outcrops along the top of a ridge system which is highly exposed, offering a commanding 360° vista (Figures 2 and 3). The soil is very shallow and light in color. Subsurface rock material is extensively covered with caliche.

The local area is presently very dry, except for a number of intermittent streams flowing from the Lake Range. Precipitation in the area is low, 5.25 inches, with 78% occurring in the winter months (USDI Buffalo Hills URA n.d.).

Immediately to the west of the quarry site lies the San Emidio Desert, representing the southern extent of the Black Rock Desert, a valley sparsely covered with greasewood and shadscale. Now a dry playa, the San Emidio Desert may have held water at various times in the past. Similarly, the playa of Winnemucca Lake, located approximately 10 miles south and east of the quarry, contained water as recently as the 1930s. The nearest present day large body of water to the site is Pyramid Lake, a remnant of Pleistocene Lake Lahontan fed by the Truckee River. The lake lies approximately 20 miles southwest of the quarry.

The quarry occurs within the general Intermontane Shadscale Vegetation Zone, specifically in the Greasewood-Shadscale association. This zone occurs in areas of gravel sediments or volcanic mountain ranges with annual precipitation between 3.5 and 7 inches (Cronquist et al. 1972). The fauna in the area consists mostly of jackrabbits, deer, and reptiles. Evidence of raptor perching exists among the chert outcrops at the northern end of the quarry. Bighorn sheep are reported to have historically occupied nearby ranges (Hall 1946:640).

## PREVIOUS RESEARCH

### Archaeology

A number of previous cultural clearances have been conducted in the area of the Lake Range Quarry. Surveys in the San Emidio Desert west of the Lake Range Quarry locality were conducted by Robert Elston (1977) and by Richard Hanes (1980). These inventories located over 30 archaeological sites, containing chert, basalt, and obsidian chipped stone materials and ground stone tools in dune areas adjacent to the playa.

South of the quarry are a number of recorded sites in the vicinity of Winnemucca Lake. A basalt quarry and associated workshops, known as the Coleman Locality (Tuohy 1970), a series of lake feature associated campsites, and the Falcon Hill Cave sites (Hattori 1982) are located at the northwestern end of the lake bed. Archaeological field work has been sporadically conducted in this area since the 1950s. Phil C. Orr, of the



Figure 2. View north along ridge,  
with Fred Petersen standing in  
quarry pit.

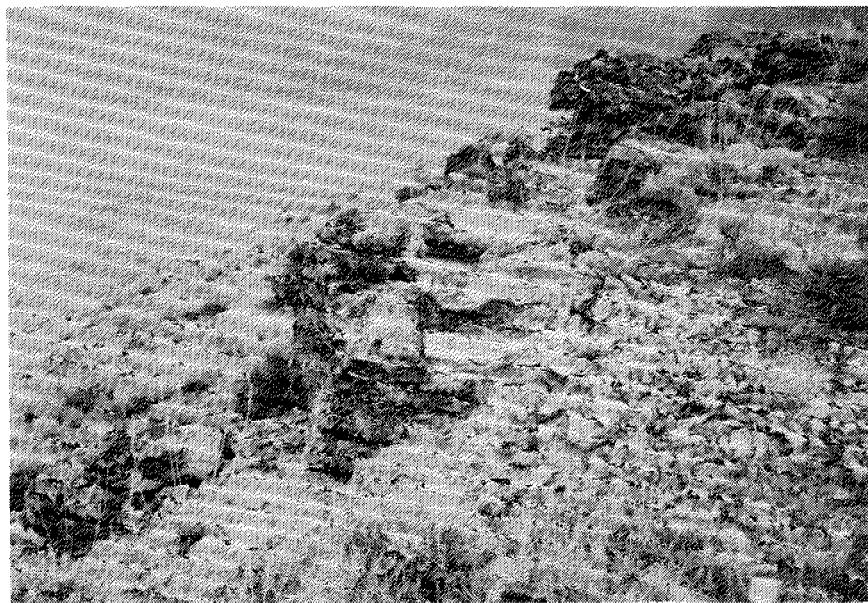


Figure 3. View of chert outcrop  
with debitage in foreground (looking  
east).

Santa Barbara Natural History Museum, conducted excavations at the Winnemucca Lake caves during the 1950s and has published a number of preliminary articles (Orr 1952, 1956, 1974).

A number of shelters and caves have been excavated around Winnemucca and Pyramid Lakes yielding a wide variety of perishable and nonperishable artifacts, including evidence for exploitation of lacustrine resources. Such evidence includes dried fish caches, fishing nets, and weirs (Orr 1974; Hattori 1982; Tuohy 1980).

A chert quarry (26 WA 2418) has been recorded near Pyramid Lake in the Bedell Flat area (Botti 1976). No study or collection has been conducted on this site, however, the site form notes chert outcrops, quarry blanks, and extensive flake scatter.

Prehistoric lithic knappers from either Winnemucca or Pyramid Lake area would have had access to the Lake Range Quarry. Chert material visually similar to that from the quarry site has been found at Pyramid Lake sites and possibly Winnemucca Lake sites (Rusco 1982; Orr 1974).

### Ethnographic Background

The Lake Range Quarry is located in a region which has been described by Stewart (1939) as a transition zone between two Northern Paiute bands, the Kamodokado and the Kuyuidokado. The Kamodokado (jackrabbit eaters) were centered around Gerlach, Nevada, and their territory included the areas of the Granite Creek and the Smoke Creek Deserts. The Kuyuidokado (black sucker eaters) covered the area around Pyramid Lake, north to Gerlach and south to Fernley.

From the archaeological record, it appears the region was inhabited much of the time by mobile hunter-gatherers dependent on annual seed procurement and hunting of big and small game. Groups were dispersed in family units most of the year, coming together during the winter months in semi-permanent camps near reliable water sources (Steward and Wheeler-Voegelin 1974).

The region appears to have been inhabited as early as 8,000-11,000 years ago and occupied intermittently through historic contact. For a detailed discussion of the cultural chronology of the area refer to the "Prehistory and History of the Winnemucca District" (Smith et al. 1983).

### Previous Quarry Research

Very few studies investigating chert quarries have been published. The majority of the quarries investigated in the west have been basalt or obsidian sources. The nearby large basalt quarry known as the Coleman Locality mentioned above, was investigated by Tuohy (1970) in the late 1950s and early 1960s. Tuohy found large bifaces or preforms of basalt as well as cores, choppers, and hammerstones. Also collected on the site were 15 complete and fragmentary stemmed points.

Two recent quarry studies of note include the Bodie Hills obsidian quarry (Singer and Ericson 1977), where a method was devised for

measuring productivity at an obsidian quarry site, and the reanalysis of the Stockhoff Basalt Quarry in Oregon (Womack 1977). The latter site was originally studied by Bryan and Tuohy (1960).

The Tosawihi Quarry, located in northern Nevada, has been examined by Rusco who investigated the associated Rossi Mine workshop localities (Rusco 1982). This study focuses on the only other large chert quarry to be analyzed in the Great Basin.

The evolution of quarry site analysis has carried investigation beyond the mere description of the artifacts present on a site, although this is still important in the total process of analysis. Emphasis has turned to the discussion of lithic processes conducted at a quarry and how these affect the physical form of the artifacts and the structure of the archaeological record. Muto (1971) presented a discussion of a continuum of stages of lithic artifact manufacture from "blank" through end product. Ruebelman (1973), in his Mesa Hill site report, discusses the definition of stages or phases of bifacial lithic reduction. Bucy (1974) explores how lithic material characteristics affect the manufacturing technology used for processing that material and the type or form of the desired product.

These current ideas for interpreting the archaeological record at large quarry sites (and regional distribution of quarry materials) have been incorporated into a model of lithic acquisition and reduction and a set of hypotheses which will be presented in this paper.

#### FIELD METHODS

A site grid was established by setting a datum point, designated N500/E500, in the southeast quadrant of the quarry. A base line was staked out at 30 meter intervals along the north-south axis of the site with 30 meter offsets east-west to keep the line along the ridge top where the majority of archaeological materials occur (Figure 4). Thirty meter cloth and metal tapes and a hand-held compass were used for laying out the base line and for mapping the site. At five meter intervals along the base line an east-west transect was established from the base line to the break of the ridge top. Quarry pits were measured and their locations mapped relative to the base line on a 1:250 scale contour map provided by Amax Explorations, Inc.

Surface collection was conducted along the east-west transect lines. Bifaces, biface fragments, and hammerstones were provenienced along the line, assigned a location number, and collected.

A 30 by 30 meter square collection unit was established at N530/E515. All bifaces and tools were collected and individually mapped. Additional collection units were planned, but due to the high density of items present the procedure was found to be too lengthy a process given the time and funding limitations.

In addition to the transects and the 30 by 30 meter unit, each quarried pit was surface collected as a unit. Only bifaces and

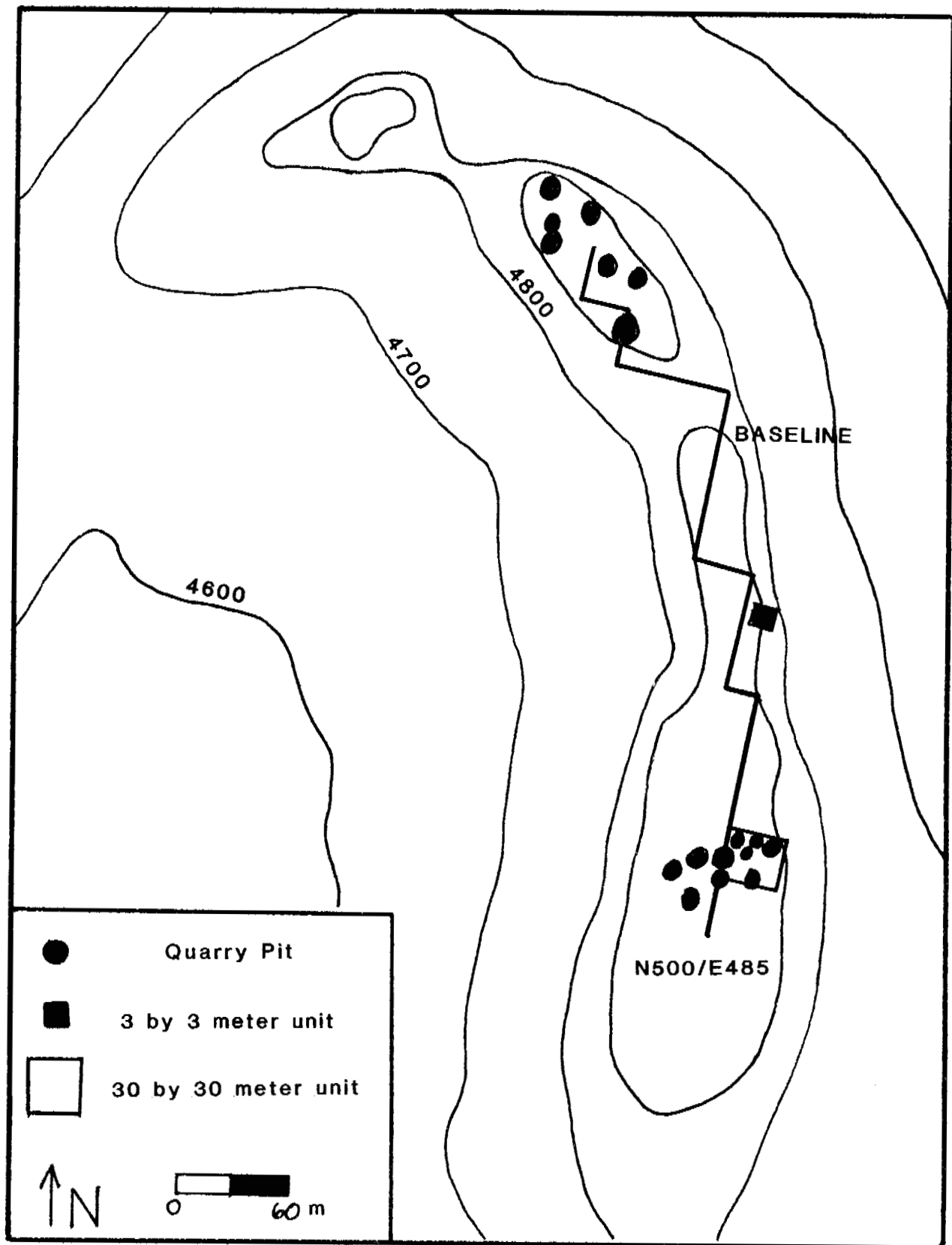


Figure 4 Lake Range Quarry Baseline and Features.

implements on the immediate surface were collected from these pit features.

A three by three meter area was chosen for complete surface collection based on the presence of a large amount of flakes and shatter as well as exposed worked bedrock. The purpose for collecting this unit was to obtain a complete sample of all artifacts from a likely "workshop" area which may have represented the activity area of one lithic knapper performing one task (personal communication, Clay Singer 1981). This complete collection avoids the biased collection of bifaces and hammerstones which was performed on the rest of the site. The unit was gridded into one by one meter sections which were collected individually.

Following the surface collection of the three by three meter square unit, the central one by one meter square was excavated in 20 cm arbitrary levels to determine if the site contained a subsurface component. All loose material was screened through a 1/8 inch mesh in the first (0-20 cm) level, and all artifactual material was bagged. Thick caliche deposits on the chert made artifact recognition difficult, especially for small flakes.

At approximately 25 cm, the caliche deposits on the chert became too thick to recognize any artifacts. A decision was made to bag all the material from the 20-40 cm level and sort it out in the lab. Every other screen load was kept and bagged. The unit was excavated to 40 cm, however, cultural material was found only to 27.5 cm.

Due to time constraints per 43 CFR 3809 mining regulations, field work on the site was limited to a two-week period. Under these conditions, collection strategies were hastily developed and required some modification in the field.

The east-west transects were inventoried quickly with the strong possibility that artifacts were missed. By collecting only observed bifaces and hammerstones, a severely skewed sample of the actual artifact assemblage on the site was obtained. A better method, considering the time limitations, would have been to use larger transect intervals than five meters, and record all artifacts, including debitage flakes, along the transect. This would better represent the artifact types and densities on the site.

#### THE LITHIC ACQUISITION-REDUCTION MODEL

The model presented here discusses possible manifestations of large prehistoric quarries. The model is derived from a number of sources which address lithic procurement and associated quarry activities. Using data gathered from the Lake Range Quarry, the model will be examined through a series of hypotheses and test implications. The model consists of the following elements:

Large quarry sites are the result of long-term and/or high intensity exploitation of lithic raw material, in this case a cryptocrystalline rock. Human activity at these quarry sites is centered on the

acquisition of material, core or flake preparation, and the initial reduction of pieces for transport away from the site (Womack 1977; Holmes 1890). The transportable quarry products are generally in the form of "roughed out" bifaces, although cores or flakes may also be selected. Further reduction and modification of the material would then take place at workshops or campsites away from the quarry.

Three possibilities of quarry exploitation may occur:

1. An emphasis on the shaping of bifaces or preforms with resulting waste flakes, broken bifaces, and discarded rejects.
2. An emphasis on large flakes and blades removed from cores which results in exhausted cores discarded on the site.
3. An emphasis on retaining both large flakes and bifaces for use and transport away from the site, resulting in small waste flakes and discarded cores and bifaces.

Blanks and bifaces found on the quarry site are assumed to be rejected items, usually broken during reduction or containing a flaw in the raw material prohibiting further work.

Different types of activities or methods of quarrying may occur on the same quarry site depending on the nature of the raw material (Toney 1972; Womack 1977). There may be a continuum of activity ranging from picking up cobbles or naturally fractured pieces to the actual mining of rock through pits and tunnelling.

Habitation does not generally occur on a quarry site. Campsites or workshops would be located off the quarry in an accessible camp location close to water or in a more hospitable area with greater life support conveniences.

The following are categories and definitions of biface reduction stages which may be present on a quarry site. These stages are based on those utilized by the Nevada State Museum and are the categories to which the data from the Lake Range Quarry was applied.

#### Stage I Bifaces

This stage includes those bifaces which have undergone initial reduction for major shaping and establishing platforms for thinning. Most of the mass has been removed including prominent ridges/humps. Cortex is usually removed but may occur in spots on the piece. The pieces are generally large (50-170 mm) and roughly shaped. Large flake scars extend to the center of the bifaces (See Figure 5).

#### Stage II Bifaces

Stage II bifaces are secondarily thinned and exhibit greater regularity in size and orientation of flake scars than the Stage I pieces. The dorsal and ventral faces appear similar, generally large in size (90-115 mm in length). Large flake scars are still evident across



the biface with some secondary reduction flake scars on the edges at the ridge. Cortex is usually not present on these pieces (See Figure 6).

### Stage III Bifaces

Stage III bifaces are shaped pieces, with thinning providing a regular edge. Scars are uniform in size and orientation. These artifacts are generally smaller than the Stage I and Stage II bifaces, due to more reduction flaking (See Figure 7).

## THE HYPOTHESES

The following six hypotheses are derived from the lithic reduction model and will be applied to data gathered from the Lake Range Quarry to determine which methods of quarry exploitation were utilized at the site.

### Hypothesis No. 1 - Material Testing and Acquisition

If the site is a prehistoric quarry, there should be evidence of acquisition and material testing of the parent rock material on the site. This activity is assumed to have been more intensive at a large quarry. Intensive testing by knappers may have led to actual quarrying activities.

#### Test Implications:

1. Assayed cobbles or rock outcrops may be found on the site. This feature can occur at bedrock outcrops or on surface boulders with outside cortex or otherwise flawed material removed. Surface cobbles may be broken open for inspection of the material quality.
2. There may be actual quarried pits or tunnels for the purpose of obtaining raw lithic material. This type of feature would be easily discernible.
3. A large amount of rock shatter should be present as a result of the assaying and mining activities. This rock shatter should not exhibit any evidence of utilization or retouch.

### Hypothesis No. 2 - Reduction of Lithic Material

If initial reduction of raw material is occurring at the quarry, a large number of cores and decortication and primary internal flakes should occur on the site, as well as tools used for reducing the material.

#### Test Implications:

1. The percentage of cores, exhausted cores, and large debitage flakes should be significantly higher than that of completed tools or bifaces. This relationship should be easily quantifiable.

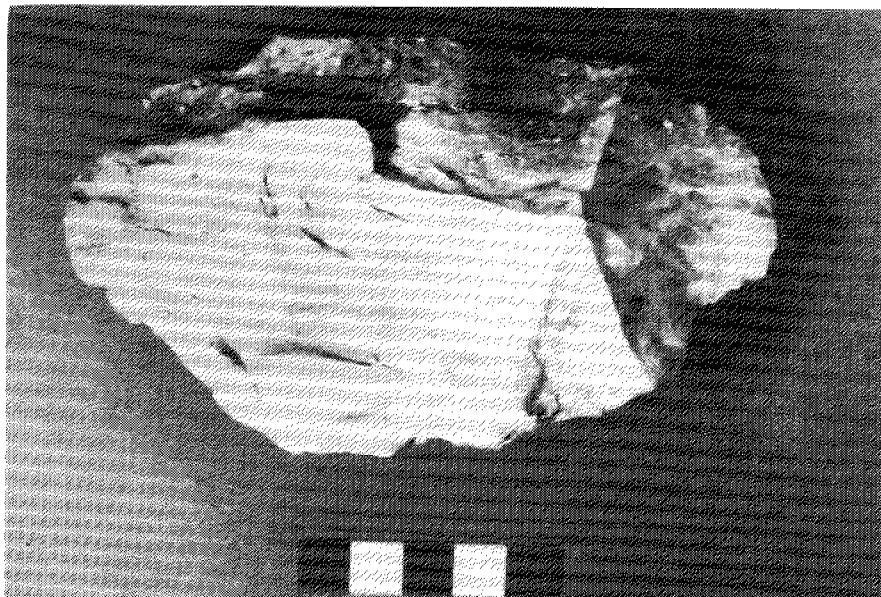


Figure 5. Stage I Biface 40-12.

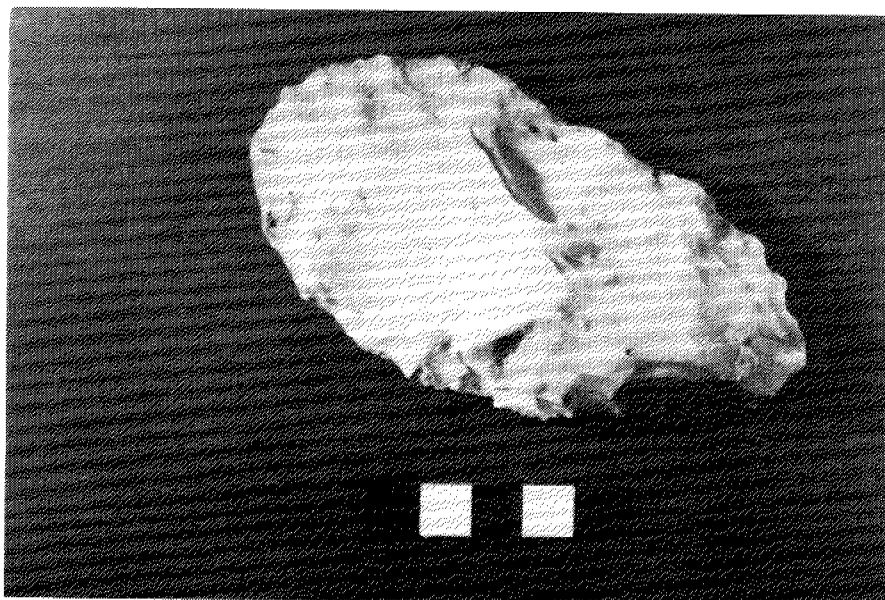


Figure 6. Stage II Biface 41-8.

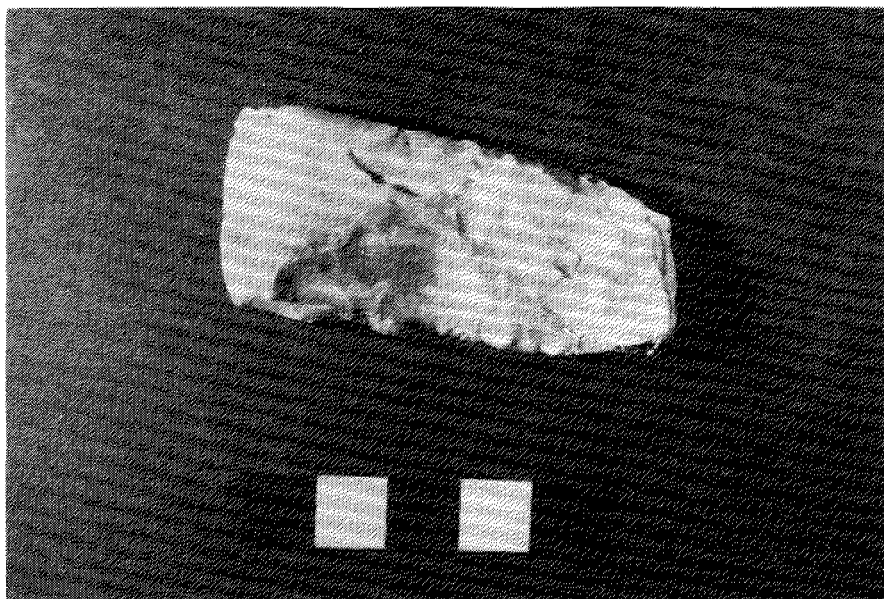


Figure 7. Stage III Biface 74-1.

2. There may be hard percussion tools present for the removal of the outer rock surfaces and initial breakdown of the rock material. These types of tools would include hammerstones and large wedges.
3. If reduction beyond cortex removal is occurring, there may be soft percussion reduction tools present such as wood billets or antlers. These tools, not likely preserved in the archaeological record, were probably not as plentiful as the hammerstone assemblages.

#### Hypothesis No. 3 - Selection for Bifaces

If bifaces are the primary production goal, this strategy should be reflected in the material present on a quarry site. Bifaces and fragments found on the site are assumed to be rejects. It is generally assumed that biface "blanks" (Stage I) are the forms produced at a quarry, while further reduction would occur elsewhere. Complete bifaces should be found in smaller quantities than broken bifaces.

#### Test Implications:

1. A large number of bifaces and biface fragments should be located on a quarry site. There may be either a continuum of production stages or a predominance of one stage over others. For example, if Stage I bifaces are the preferred stage there should be present few, if any, Stage II or III bifaces or fragments at the site.
2. Broken or flawed pieces of the biface stages should be found in greater quantities than complete bifaces.

#### Hypothesis No. 4 - Selection for Large Flakes

If large flakes are being selected, artifacts on the quarry site should be different than those found if only bifaces are desired.

#### Test Implications:

1. A large number of exhausted cores and core fragments should be present on the site.
2. Large flakes should not occur in large quantities on the site unless they are of poor quality material, broken during the reduction processes, or proportionally not conducive to further reduction.
3. Complete or fragmentary bifaces should not occur on the site in any significant quantity. Effort would not be put into the manufacture of bifaces if only large flakes were selected.

#### Hypothesis No. 5 - Selection for Both Bifaces and Large Flakes

If both forms of artifacts are being selected, the artifacts on the site should reflect this through low frequency of occurrence of all quality complete bifaces and large flakes.

#### Test Implications:

1. There should be a greater percentage of small waste flakes relative to large flakes and bifaces.
2. Some exhausted cores may be present on the site as well as poor quality or broken bifaces and large flakes.

#### Hypothesis No. 6 - Absence of Habitation

If the primary activity on a quarry is lithic procurement and reduction, with habitation occurring off the site, there should be little, if any, habitation refuse or evidence of occupation on the site. Some limited temporary camping may have taken place.

#### Test Implications:

1. There should not be evidence of extended habitation use on the site such as midden deposits, plant processing implements, extensive tool assemblages, or permanent habitation structures. Temporary shelters may occur.
2. Hearths may exist for other than habitation uses, such as heat treating lithic material. Hearth material should not contain large quantities of organic food matter. Fire-cracked rock and heat spalls may be observed.

#### DESCRIPTION OF THE ARTIFACTS

The majority of the artifacts recovered from the Lake Range Quarry were bifaces. Some hammerstones and wedges were also observed and collected. Following is a description of each artifact category from the site.

#### Bifaces

Bifaces collected from the Lake Range Quarry have been classified into one of three reduction stages presented in the model section of this paper. Of the three stages discussed, Stages I and II are most represented on the site. Only one Stage III biface was observed. The complete bifaces range in length from 50 mm to 170 mm. Many bifaces are either fragments (probably broken during reduction processes) or have flaws in the material which would prevent quality knapping.

#### Stage I Bifaces

A total of 91 Stage I bifaces were collected from the site. The 61 complete pieces ranged in length from 51.4 mm to 170 mm. These bifaces have been roughly shaped with large flake scars extending to a center ridge. The majority of the cortex is removed although some of the specimens still retained a small amount, usually near the center of the artifact face.

Table 1 shows the size ranges and general locations of both the complete and fragmentary Stage I bifaces.

#### Stage II Bifaces

Seven Stage II bifaces were recovered from the Lake Range Quarry. Of these, three were complete specimens. These bifaces differ from the Stage I in that they show a greater uniformity and regularity in size and shaping. The secondary thinning has been performed on the edges of these pieces. A few of the bifaces exhibit Stage I characteristics on one face and Stage II on the other. These have been classified as Stage II bifaces since they have been reduced beyond the Stage I level. Table 2 shows the size ranges and locations of the Stage II bifaces.

#### Stage III Bifaces

One Stage III biface was collected from the site. The biface is a fragment with smaller, more regular flake scars than the other bifaces on the site. The fragment measures 63.2 mm in length, 29.2 mm in width, 12.3 mm thick, and weighs 27.1 gram.

#### Hammerstones

Forty-eight hammerstones were collected from the surface transects and quarried pits. The hammerstones fell into three distinct categories: cobble hammerstones, large flake hammerstones, and ground stone hammerstones. Seventy-seven percent were cobble hammerstones.

##### Cobble Hammerstones

The cobble hammerstones are small cobbles which can be held in the hand and used as a hammer. They usually have battering on two of the ends but frequently the entire surface shows sign of use. The cobble hammerstones are predominantly basalt with the exception of one chert specimen. The complete hammerstones ranged in length from 47.4 mm to 93.9 mm. The fragments ranged in size from 44.3 mm to 128.1 mm. Table 3 shows sizes and locations of these hammerstones.

##### Large Flake Hammerstones

Large flake hammerstones are generally large flakes or pieces which have a wedge-shaped cross section. Battering is usually along the narrow sharp edge. Due to the nature of the form, these hammerstones are all considered complete. They range in length from 80.2 mm to 146.0 mm. The flake hammerstones are predominately basalt with a few quartz pieces. Table 4 presents metric measurements and locations of large flake hammerstones.

Table 1. Metric Measurements of Stage I Bifaces.

	Length (mm)		Width (mm)		Thickness (mm)		Weight (gm)		Surface Transects	Quarry Pits	Total
	Range	Mean	Range	Mean	Range	Mean	Range	Mean			
Complete	51-170/117		27-111/82		16-86/38		413-1029/330		19	42	61
Fragments	38-133/82		57-111/77		20-57/32		70-517/215		15	15	30
TOTALS									34	57	91

Table 2. Metric Measurements of Stage II Bifaces.

	Length (mm)		Width (mm)		Thickness (mm)		Weight (gm)		Surface Transects	Quarry Pits	Total
	Range	Mean	Range	Mean	Range	Mean	Range	Mean			
Complete	90-115/110		58-65/62		25-31/28		133-160/149		1	2	3
Fragments	44-92/64		53-80/66		16-27/22		51-137/94		2	2	4
TOTALS									3	4	7

Table 3. Metric Measurements of Cobble Hammerstones.

	Length (mm)		Width (mm)		Thickness (mm)		Weight (gm)		Surface Transects	Quarry Pits	Total
	Range	Mean	Range	Mean	Range	Mean	Range	Mean			
Complete	66-128/89		40-104/73		25-72/50		85-1127/376		18	1	19
Fragments	43-145/87		52-104/70		17-60/40		89-921/340		14	4	18
TOTALS									32	5	37

Table 4. Metric Measurements of Large Flake Hammerstones.

	Length (mm)		Width (mm)		Thickness (mm)		Weight (gm)		Surface Transects	Quarry Pits	Total
	Range	Mean	Range	Mean	Range	Mean	Range	Mean			
Complete	80-146/121		76-161/110		25-49/41		257-1691/677		6	0	6
Fragments	-		-		-		-				
TOTALS									6	0	6

Table 5. Metric Measurements of Ground Stone Hammerstones.

	Length (mm)		Width (mm)		Thickness (mm)		Weight (gm)		Surface Transects	Quarry Pits	Total
	Range	Mean	Range	Mean	Range	Mean	Range	Mean			
Complete	-		-		-		-		-	-	-
Fragments	69-109/93		70-104/87		25-57/45		294-564/418		5	0	5
TOTALS									5	0	5



Table 6. Metric Measurements of Wedges.

	Length (mm)		Width (mm)		Thickness (mm)		Weight (gm)		Surface Transects	Quarry Pits	Total
	Range	Mean	Range	Mean	Range	Mean	Range	Mean			
Surface	70-172/136		71-101/67		18-44/30		110-681/435		4	0	4

Table 7. Metric Measurements of Cores from 3 by 3 Meter Unit.

	Length (mm)		Width (mm)		Thickness (mm)		Weight (gm)		Total
	Range	Mean	Range	Mean	Range	Mean	Range	Mean	
Surface	81-221/129		14-180/99		13-175/68		50-over/818		21
Subsurface	111-116/115		19-113/88		14-19/17		346-1579/954		4
TOTALS									25

### Ground Stone Hammerstones

Ground stone hammerstones are pieces of ground stone, which were employed as hammers. They have heavily ground surfaces with battering present on the ends of the pieces. Five ground stone hammerstones were collected from the Lake Range Quarry site. All are fragments and range in length from 68.8 mm to 100.0 mm. Table 5 presents a summary of these hammerstones.

### Wedges

Four tools exhibiting wedge use characteristics as opposed to hammerstone battering were collected from the site. The tools are modified basalt flakes showing edge damage. Table 6 shows the range and mean of these tools.

### Cores and Debitage

Cores anddebitage were not collected from the majority of the site. A complete sample was collected from the three by three meter square. The square was gridded into nine, one by one meter units and each unit collected independently.

Twenty-five cores or core fragments were recovered from the three by three meter square. Four of these were located in the subsurface 0-20 cm level. Table 7 shows the range of sizes of these cores.

Debitage consisted of decortication and interior waste flakes. A detailed analysis has not been conducted on thedebitage. A total of 1,151 flakes was collected from the surface of the three by three meter square, weighing 38.7 Kg. The subsurface component of unit 1.5 yielded 961 flakes weighing 32.2 Kg.

Table 8 summarizes the artifacts located on the surface of the three by three meter collection square.

Table 8. Three By Three Meter Surface Collection

Artifact	Unit									Total
	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	
Cores	1	3	4	5	5	3		1	3	25
Debitage	88	178	202	140	312	52	46	30	103	1,151
Bifaces								1		1
Total	89	181	206	145	317	55	46	32	106	1,177

The central unit, 1.5, of the collection square was excavated to a depth of approximately 40 cm. Due to the nature of the subsurface bedrock, it was impossible to excavate arbitrary 10 cm levels. Consequently, material was collected in 20 cm increments. The surface of the unit was collected prior to excavation. Table 9 shows the results of the excavation.

Table 9. Test Excavation Results Unit 1.5

Artifacts	Level		
	0-20 cm	20-40	Total
Cores	4	0	4
Debitage	960	1	961
Total	964	1	965

The majority of the artifacts were located between 0-25 cm, indicating a non-stratified surface manifestation at least in this portion of the site.

In addition to the artifacts collected from the transects and the three by three meter unit, a number of samples of natural rock were collected. Nine separate samples were taken from bedrock outcrops across the site. These samples are currently being analyzed by the Nevada State Museum.

#### DISCUSSION AND ANALYSIS

In this section the results of the artifact analysis and on-site observations will be applied to the hypotheses proposed above.

##### Hypothesis No. 1: Material Testing and Acquisition

This hypothesis predicts that a prehistoric quarry will contain evidence of raw material testing and acquisition. The first test of this hypothesis states that assayed cobbles or boulders may exist on the site. Extensive evidence of this type of activity is present at the Lake Range Quarry.

Most of the bedrock outcrops located on the site exhibit evidence of material having been intentionally removed. Characteristics of natural weathering were not observed. Battering marks, step fracture scars, negative bulbs of percussion, and large amounts of shatter surrounding the outcrops indicate human activity. Large rocks on the surface are split open, with flakes removed from interior fracture surfaces. This test, conducted through observations on the site, supports the hypothesis.

The second test outlines the possibility of quarried pits or tunnels, indicating a method of obtaining raw lithic material. Quarried pits are a predominate feature of this site.

There are 17 separate quarried pits, ranging in diameter from three to five meters and up to 1.5 meters in depth. This test was conducted through observations on the site and supports the hypothesis.

The third test for the materials acquisition hypothesis predicts a large amount of nonutilized, unretouched rock shatter resulting from

mining activities. Rock shatter exists over the entire surface of the site and is particularly dense surrounding exposed bedrock outcrops and at the quarried pits. This test supports the hypothesis.

Three tests were used to determine if raw lithic material was tested or acquired on the Lake Range Quarry. The results of all three tests were positive, lending support to the hypothesis.

#### Hypothesis No. 2: Reduction of Lithic Material

This hypothesis proposes the occurrence of large quantities of cores, decortication, and primary flakes on a quarry site. Three test implications presented above were compared with data from the site.

The first test states cores, exhausted cores, and large reduction flakes will occur in greater frequency than completed tools or biface blanks on the site.

From general site observations and the three by three meter surface collection, a much larger percentage of waste flakes and cores were noted than of completed bifaces or tools. Only one well-defined Stage III biface was observed on the site. This test supports the hypothesis.

The second test predicts the possible presence of hard percussion tools, such as hammerstones or large wedges. These would have been used for the removal of rock material and initial reduction flaking. Forty-eight hammerstones were collected from the surface of the site. These tools included small cobble hammers, large flake hammers, and pieces of ground stone which exhibit battering. In addition, four large tools were collected which show scraper or wedge use. This test supports the hypothesis.

The final test describes the types of tools expected if lithic reduction beyond initial cortex removal is performed on the site. Soft percussion tools such as wood billets or antlers would be anticipated, but were not observed on the Lake Range Quarry. Therefore, this test does not support the hypothesis.

From the above discussion, the hypothesis is supported by data gathered on the site. Lithic reduction occurred on the site as indicated by the presence of hard percussion tools and the high ratio of reduction flakes to tools or completed bifaces. The absence of soft percussion tools does not discount the hypothesis, as these artifacts may have been carried off the site, or may not have been preserved in the archaeological record.

#### Hypothesis No. 3: Selection for Specific Biface Stage

The third hypothesis discusses the possibility of bifaces as the selected unit of production on the site. Two tests are presented for this hypothesis.

The first test predicts the presence of bifaces and biface fragments on the site. A total of 99 bifaces and biface fragments were collected

from the Lake Range Quarry. A more intensive collection would have yielded a larger sample. Laboratory analysis of the bifaces collected from the site indicates a definite predominance of one stage over others. Ninety-one Stage I bifaces, complete and fragmentary, were collected from the site, with only seven Stage II bifaces, and one Stage III biface recovered. The preponderance of Stage I bifaces over other stages suggests the preferred level of manufacture to have been Stage I. That Stage II bifaces were being produced is indicated by their presence on the site, although in far less numbers than Stage I. If Stage II was the preferred biface form, there should be more broken or rejected pieces than found. There should be few, if any, Stage III bifaces. This test supports the hypothesis that bifaces were manufactured on the site, and there is a predominance of one production stage (Stage I) over others.

The second test suggests broken or flawed bifaces will outnumber complete bifaces of the desired stage. Sixty-four complete bifaces were collected from the site as opposed to 35 fragments. This may be a reflection of bias on the part of the field personnel. Broken pieces of bifaces may not have been recognized as such under the field methods employed. The data available does not support the hypothesis.

Two tests were presented for this hypothesis. While the second did not support the hypothesis, the first test gives strong support that bifaces were manufactured on the quarry. The possibility of a certain biface stage selected over others cannot be discounted.

#### Hypothesis No. 4: Selection for Large Flakes

This hypothesis proposes that if flakes were more desired than bifaces as the preferred form for transport, the artifacts on the site will reflect this. Two tests have been established.

The first test suggests a large number of cores and core fragments should be present on the site. Twenty-five cores were collected from the three by three meter collection unit. However, since cores were not collected from the majority of the site it is difficult to apply this test to the Lake Range Quarry. Cores were observed but no quantifiable measure is available.

The second test predicts that if large flakes are being produced, they should not be present on the site in large quantities, unless broken or of poor quality since they would have been removed from the site. Large flakes were not collected during field work, nor were they observed in large quantities. The majority of flakes on the site were medium to small in size with very few large flake fragments. This test result seems to support the hypothesis.

The third test suggests the absence of complete or fragmentary bifaces if large flakes are selected. A total of 99 bifaces and biface fragments were collected during data recovery on the site. This number is significantly high to dispute the test, and not support the hypothesis.

This hypothesis was difficult to test with data available from the Lake Range Quarry. The selection of large flakes for transport should

not be discounted, although there is not strong evidence to support the hypothesis.

#### Hypothesis No. 5: Selection for Bifaces and Large Flakes

This hypothesis proposes a low frequency of quality bifaces and large flakes if both forms are selected for transport away from the quarry. Two test implications were developed for this hypotheses.

The first test postulates a greater percentage of small waste flakes to large flakes and bifaces. The number of small flakes recovered and observed from the site is greater than large flakes or cores. A total of 1,151 pieces of small flake debitage was collected from the surface of the three by three meter collection unit and 961 small flakes from the excavated material. This number compares to 25 cores and one biface from the unit. This test result supports the hypothesis.

The second test predicts exhausted cores, broken bifaces, and rejected large flakes on the site. A number of cores were observed on the site but were not collected other than the 25 from the three by three meter unit. Thirty-five fragmentary bifaces were collected. Few large flakes or fragments were observed on the site. The results of this test support the hypothesis, although this test was difficult to apply with the data collected at the Lake Range site.

Both tests developed support the hypothesis. Bifaces and large flakes may have been selected for transport from the site.

#### Hypothesis No. 6: Absence of Habitation

This hypothesis suggests habitation occurs off a quarry site. Two implications were formulated to test for habitation. The first states that there should not be evidence of habitation such as midden deposits, structures or milling implements. No evidence of extensive occupation was observed on the site. A few ground stone fragments were collected but they showed evidence of use as hammers rather than food processing. The results of this test support the hypothesis.

The second test predicts hearths on the site may have been used for heat treating the lithic material or for temporary heat or cooking sources. Any hearths located should not contain significant quantities of organic food material. There was no evidence of hearths or fire pits on the surface of the site although some fire-cracked rock and apparently heat-treated chert were observed and collected. The results of this test tend to support the hypothesis, although evidence of this type may not have preserved well on a surface site.

The test results for this hypothesis tend to support the idea that habitation did not occur on the Lake Range Quarry.

## SUMMARY AND CONCLUSIONS

Systematic surface collection and one test excavation unit yielded a total of 171 artifacts from the Lake Range Quarry. Ninety-nine of these were bifaces and biface fragments. The bifaces were classified into three reduction sequence categories. Stage I bifaces (quarry blanks) show initial reduction including removal of most cortex, major shaping and thinning. Ninety-one Stage I bifaces were collected.

Stage II bifaces are defined as pieces which have been secondarily thinned with flake scars more uniform in size and orientation. Shaping is more defined. Seven Stage II bifaces were recovered from the quarry.

Stage III bifaces are thin, regularly flaked artifacts. This category includes well made bifaces. Only one Stage III biface was recovered from the site.

Forty-eight hammerstones were collected from the Lake Range Quarry. Of these, 37 are classified as cobble hammers, small hand held basalt cobbles with battering on ends. Six large flake hammers were collected. These are large basalt flakes with heavy battering marks on the edges. The third category of hammers recovered from the quarry are ground stone fragments with battering on edges. Five ground stone hammers were collected.

Four basalt wedging tools were also recovered from the site. They are large flakes with scraper type edge damage.

Twenty-five cores and core fragments were recovered and excavated from the three by three meter unit. Cores were not recovered along surface transects or elsewhere on the site.

The artifact data collected from the Lake Range Quarry was used to test a set of six hypotheses proposed to determine the nature of activities occurring on a large prehistoric quarry. The first and second hypotheses predicting the assaying and acquisition of raw lithic material and the initial reduction of that material on a quarry were supported by the data. The third, fourth, and fifth hypotheses examine the possible form of the reduced material selected for transport from the site. The proposed types were a specific biface stage (I, II, or III), large flake, or biface stage and flakes. The selection for a specific biface stage, Stage I, was generally supported by the data. The selection of large flakes only was not supported by the data, but the selection of both bifaces and flakes was supported. The final hypothesis predicts the absence of habitation on the site. This is supported by the data.

The application of the data to the hypotheses suggests certain activities occurred on the Lake Range Quarry. The chert material on the site was assayed and actively sought. The quarried pits indicate areas where seemingly higher grade subsurface material was removed while reduced bedrock outcrops and extensive surface shatter point toward the testing and acquisition of surface material.

A preference toward a specific form of transportable material is apparent. The model presented above is reinforced by the positive results of the tested hypotheses. Of the three possible avenues of quarry exploitation, the data suggests bifaces were manufactured and transported from the site for further reduction and final shaping into tools. Large flakes of raw material may also have been removed. Evidence of habitation on the site is lacking. Further confirmation can come from investigations at habitation sites in the nearby San Emidio Desert.

Few chert quarries have been studied in the Great Basin, the majority of the work focusing on basalt or obsidian sources. The Lake Range Quarry contains features similar to the Tosowihi Quarry in Elko County, although smaller in scale. The Tosowihi Quarry contains hundreds of quarry pits, caches of bifaces, with reduced boulders and colluvial surface samples (Rusco 1982). The partially recorded chert quarry (26 WA 2418) near Bedell Flat, west of Pyramid Lake, contains chert outcrops with evidence of reduction, possible quarry blanks, and an extensive flake scatter on the surface (Botti 1976).

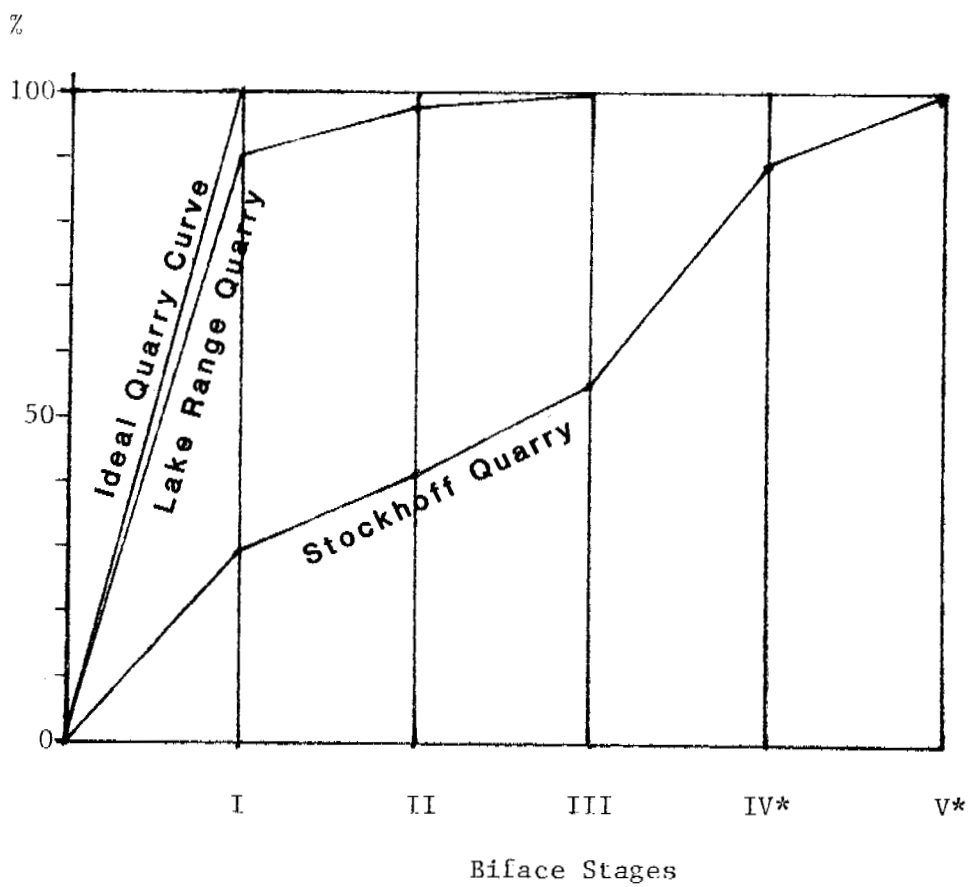
Womack (1977) mentions the occurrence of hammerstones at the Stockhoff Quarry but does not discuss them in detail. The Stockhoff Quarry is similar to the Lake Range Quarry in the occurrence of a sequential stage of manufacture for the reduction of bifaces for transport from the site. This situation may be a factor of the natural state of the raw material. Boulder outcrops and veins of rock material cannot be transported as is and must be reduced to manageable size. Lithic sources which occur as small colluvial material can easily be carried away in an unaltered form, only assayed to determine if they were worth carrying.

Thomas (1983) discusses the lithic artifact assemblage for Gatecliff Shelter in terms of Muto's (1971) blank-preform-product continuum. He has established a hypothetical configuration of bifacial technology profiles and has applied this to five archaeological sites, one of which is the Stockhoff Quarry (Womack 1977; Bryan and Tuohy 1960). Figure 8 is based on Thomas' tables, adding the Lake Range Quarry. Biface stages used in this study are essentially equivalent to the first three stages used by Thomas for Gatecliff Shelter (1983). The table shows the bifacial artifacts recovered at the site closely resemble that of the ideal quarry curve. This correlation lends support to the suggestion of Stage I bifaces as the primary production stage at the Lake Range site.

Future directions in local quarry research should include comparative studies, particularly, the Tosowihi, Lake Range, and 26 WA 2418 sites. Work similar to Rusco's (1982) at the Rossi Mine sites, which examine the workshops associated with large quarry sites, should be considered for other quarries. Sites recorded in the San Emidio Desert, west of the Lake Range, should be reexamined with lithic reduction models in mind. Chemical "fingerprinting" analysis can be conducted on raw chert material from the Lake Range to aid in the identification of this material on other sites.

It is hoped this study will aid in the further expansion of ideas for study and analysis of large quarry sites.





\* Not considered in this study

Figure 8 . Cumulative frequencies of biface stages (from Thomas 1983: Figure 212).

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